Clostridium difficile Infection Prevention

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APIC CALIFORNIA APIC COORDINATING COUNCIL

Basics of Infection Prevention
2-Day Mini-Course
October-November 2011

Objectives

- Describe the etiology and epidemiology of *C. difficile* infection (CDI)
- Review evidence-based clinical practices for preventing CDI
- Discuss strategies to reduce CDI within the hospital and other healthcare settings
- Review CDI surveillance

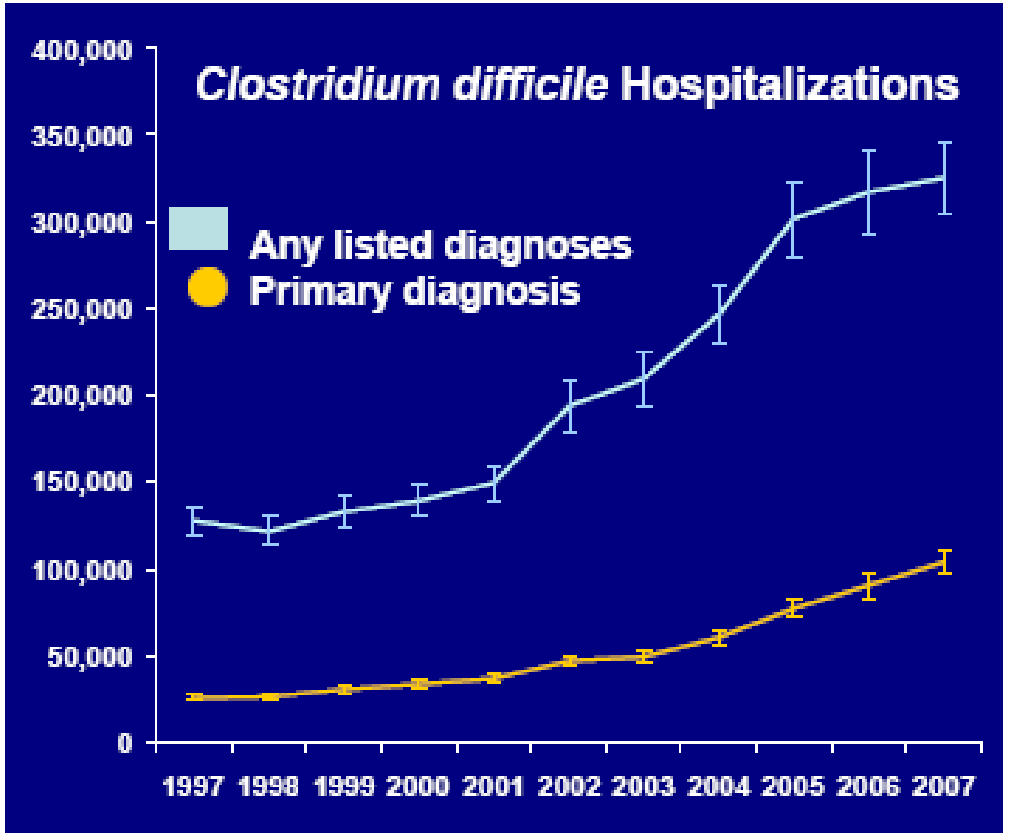
Clostridium difficile Bacteria

- Gram positive, anaerobic, spore-forming bacillus
- Outer coating 'sticky', allowing firm adherence to environmental surfaces
- Produces spores that can survive for months in the environment
- Contamination of environment well-documented
  - Contamination most extensive in close proximity to symptomatic patients
  - Spores highly resistant to cleaning and disinfection
- Colonizes 2-3% of healthy adults, 40% of neonates

Libby & Bearman (2009). Bacteremia due to *Clostridium difficile*, review of the literature. *Int J Inf Dis,* 13, e305-e309.

Epidemiology of *C. difficile* Infection (CDI)

- Most common cause of *infectious* diarrhea in hospitalized patients
- *C. difficile* infection (CDI) ranges in severity from diarrhea → colitis → toxic megacolon → death
- Incidence *and* severity of illness appear to be increasing



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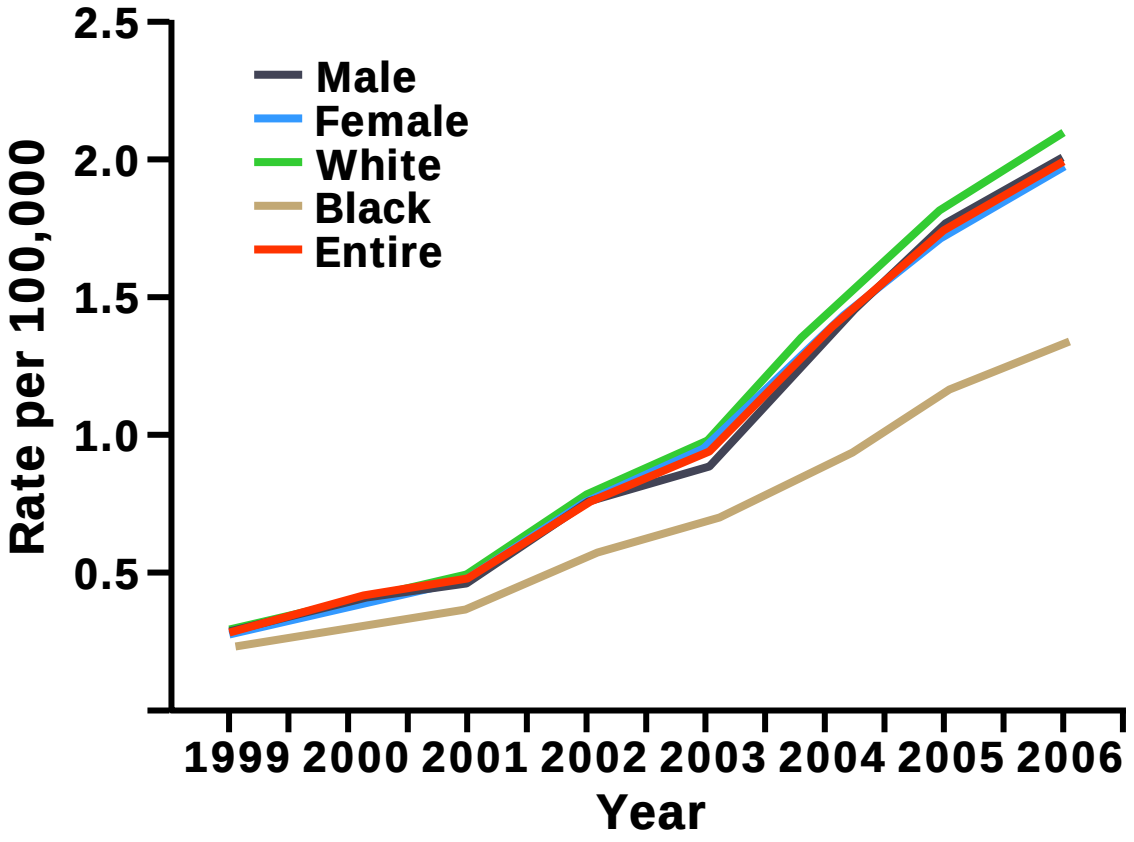
Age-Adjusted Death Rates for Enterocolitis Due to *C. difficile*, 1999–2006



Heron et al. Natl Vital Stat Rep 2009;57(14).
www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57_14.pdf

New Epidemic Strain of *C. difficile*

- BI/NAP1/027
  - Historically uncommon – epidemic since 2000
- More resistant to fluoroquinolones (e.g. Cipro)
- More virulent
  - Increased toxin A and B production
  - Toxin B binding factor, more adherence in the gut
  - Increased sporulation

McDonald et al. N Engl J Med. 2005
Warny et al. Lancet. 2005
Stabler et al. J Med Micro. 2008
Akerlund et al. J Clin Microbiol. 2008

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Scope of CDI in Healthcare Facilities

Annual cases of CDI

- 165,000 Hospital acquired (Hospital Onset)
  - 9,000 deaths
- 50,000 Hospital associated (up to 4 weeks post-discharge)
  - 3,000 deaths
- 263,000 Nursing home onset
  - 16,500 deaths

Campbell Infect Control Hosp Epidemiol. 2009.
Dubberke Emerg Infect Dis. 2008;14:1031-8.
Dubberke Clin Infect Dis. 2008
Elixhauser et al. HCUP Statistical Brief #50. 2008.

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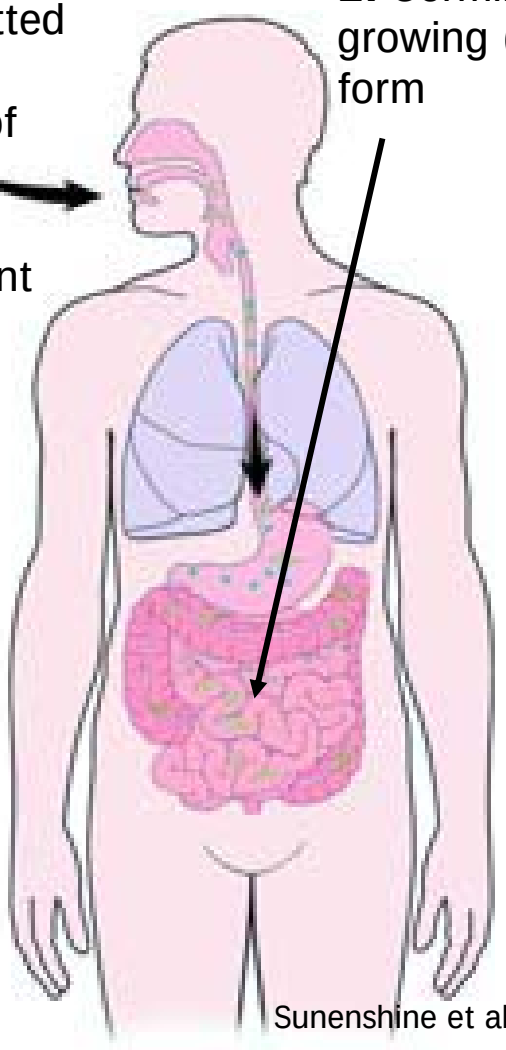
Pathogenesis of CDI

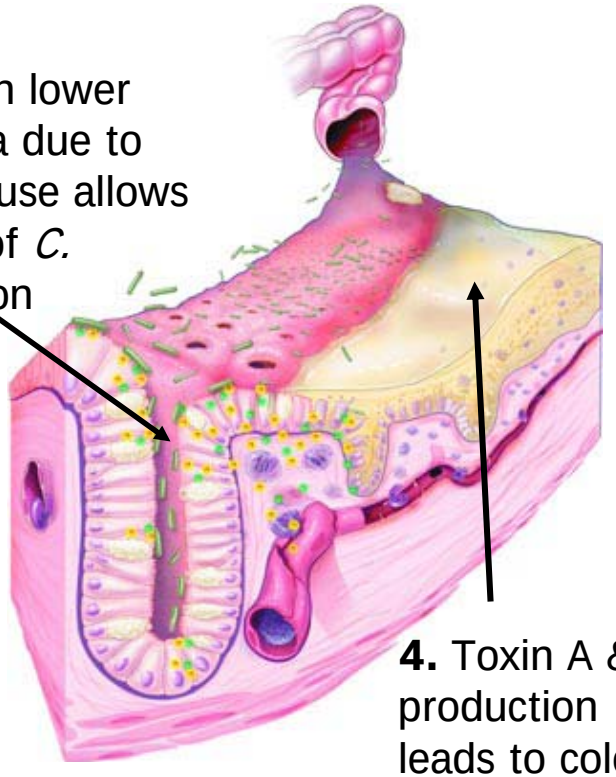
1. Ingestion of spores transmitted to patients via the hands of healthcare personnel and environment

Source of contamination with *C. difficile* spores?
Other patients!

2. Germination into growing (vegetative) form



3. Changes in lower intestinal flora due to antimicrobial use allows proliferation of *C. difficile* in colon



4. Toxin A & B production leads to colon damage

Sunenshine et al. Cleve Clin J Med. 2006;73:187-97.

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Healthcare

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Diagnosis of CDI

- Symptoms - usually diarrhea
- ≥3 unformed stools over 24 hours
- Positive stool test for presence of *C. difficile* or toxins
- Diagnostic imaging
  - Colonscopy
  - Abdominal CT Scan

Cohen, S. (2008). Clostridium difficile Infection: Current Challenges and Controversies. Retrieved from http://www.rmei.com/CDI052/

Risk Factors for CDI

- Acquisition of *C. difficile* bacteria
- Antimicrobial exposure
- Advanced age
- Underlying illness
- Immunosuppression
- Tube feeds
- ? Gastric acid suppression
- Prolonged stay in healthcare facility
- Inflammatory bowel disease / GI surgery

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Modifiable risk factors

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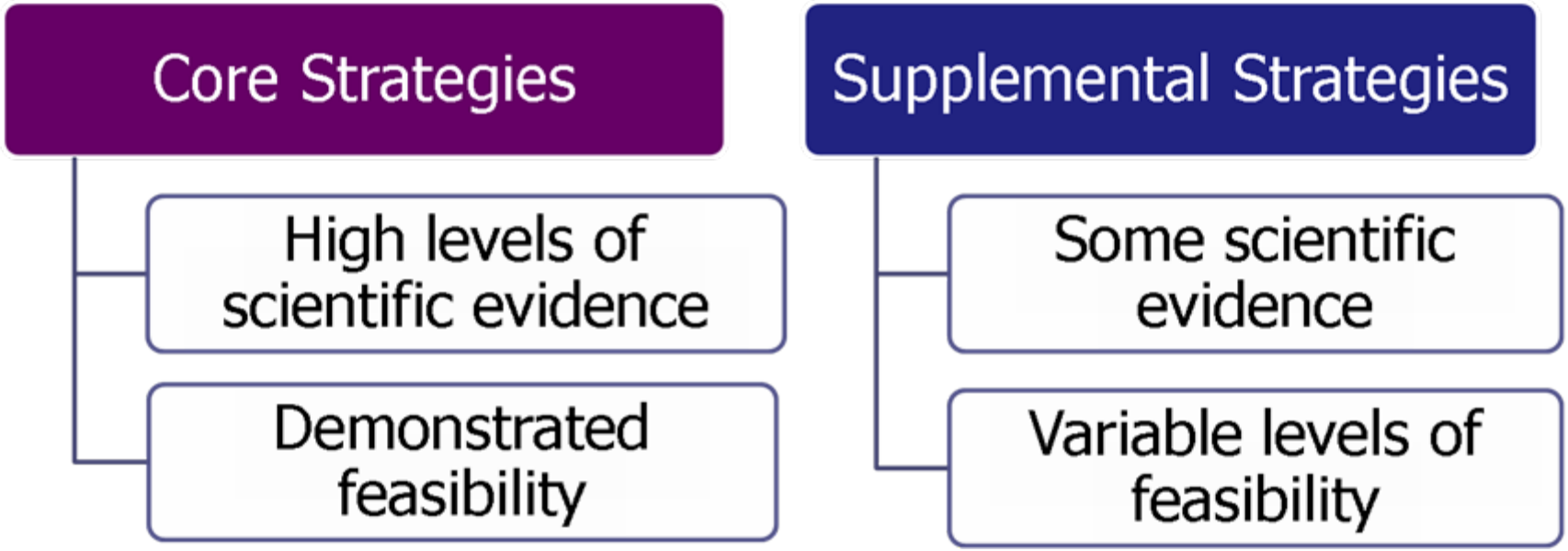
To review

CDC Prevention Strategies



- Should become standard practice

- Consider implementing <u>in addition to Core</u> when infections persist or rates are high

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CDI Prevention Strategies

Core

- Contact Precautions for duration of diarrhea
- Hand hygiene
- Cleaning and disinfection of equipment and environment
- Laboratory-based alert system for immediate notification of positive test results
- Education about CDI for HCW, housekeeping, administration, patients, families

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CDI Prevention Strategies

Supplemental

- Implement an antimicrobial stewardship program
  Note: will likely be changed by CDC to a Core strategy
- Extend use of Contact Precautions beyond duration of diarrhea (e.g. 48 hours)
- Presumptive isolation for patients with diarrhea pending confirmation of CDI
- Perform handwashing (soap and water) before exiting room of CDI patient
- Implement universal glove use on units with high CDI rates
- Use sodium hypochlorite (bleach) agents for environmental cleaning

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Considerations for CDI Supplemental Prevention Strategies

Antimicrobial Stewardship

- Consider focused effort to reduce use of broad-spectrum antibiotics
  - Prospective study in 3 acute medical wards for elderly demonstrated impact of antimicrobial management on reducing CDI
    - Introduced a narrow-spectrum antibiotic policy
    - Reinforced using feedback
    - Associated with significant changes in targeted antibiotics and a significant reduction in CDI

Fowler et al. J Antimicrob Chemother 2007;59:990-5.

Considerations for CDI Supplemental Prevention Strategies

Presumptive Isolation

- Patients with CDI may contaminate environment and hands of healthcare personnel before results of testing known
- For patients with ≥3 unformed (i.e. taking shape of container) stools within 24 hours
  - Send stool specimen for C difficile testing
  - Isolate patient pending results
  - Exception: patient with possible recurrent CDI (isolate and test following first unformed stool)

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Considerations for CDI Supplemental Prevention Strategies

Handwashing (instead of alcohol gel)

- Alcohol hand gels not sporicidal
- Handwashing recommended following contact with CDI patient or environment
- Hand washing with soap or antimicrobial/antisepsis agent is equally effective in removing *C.difficile* spores from hands of healthcare workers

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Product Comparison for *C. difficile* Spore Removal from Hands

Conclusion: Spores may be difficult to eradicate even *with* hand washing

Product	Log10 Reduction
Tap Water	0.76
CHG (4%) antimicrobial hand wash	0.77
Non-antimicrobial hand wash	0.78
Non-antimicrobial body wash	0.86
Triclosan (0.3%) antimicrobial hand wash	0.99
Heavy duty hand cleaner used in manufacturing environments	1.21*

* Only value statistically better than others

Edmonds, et al. Presented at SHEA 2009; Abstract 43.

Considerations for CDI Supplemental Prevention Strategies

Universal Glove Use

- Spores difficult to remove even with hand washing
- Adherence to glove use (with Contact precautions) critical to preventing *C. difficile* transmission via hands of HCW
- For facilities or units with high CDI rates, consider adopting routine glove use for ALL patient care ("universal")
- Rationale
  - Asymptomatic carriers play a role in transmission (though magnitude of contribution unknown)
  - Practical CDI screening tests not available

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Considerations for CDI Supplemental Prevention Strategies

Use of Bleach for Routine Cleaning

- Bleach can kill spores - most other standard disinfectants cannot
  - Limited data suggest cleaning with bleach (1:10 dilution prepared fresh daily) reduces *C. difficile* transmission
  - Two before-after studies showed benefit on units with high endemic CDI rates
  - Bleach may be most effective in reducing burden where CDI rates high
- EPA has recently registered other sporicidal disinfectants

Environmental Cleaning

- Assess **adequacy** of cleaning before making decisions to change cleaning products (**such as to bleach**)
- Ensure thorough cleaning of CDI patient care areas
  - Focus on high-touch surfaces and bathroom
- Study in 3 hospitals used fluorescence to assess cleaning
  - Showed only 47% high-touch surfaces cleaned
  - Educational intervention with environmental services staff resulted in sustained improvement
- Use of environmental markers a promising method to improve cleaning in hospitals

Mayfield et al. Clin Infect Dis 2000;31:995-1000.
Wilcox et al. J Hosp Infect 2003;54:109-14.

No Recommendation

- Probiotics
  - Naturally occurring live bacteria
  - Rational for use is to prevent CDI by restoring normal flora
- Decolonization
  - No data to support decolonization

Reference: APIC. (2008). Guide to the elimination of *Clostridium difficile*. Retrieved from http://www.apic.org/Content/NavigationMenu/PracticeGuidance/APICEliminationGuides/C.diff_Elimination_guide_logo.pdf

CDI Prevention Process Measures

Core

- Measure compliance with hand hygiene and contact precautions
- Assess adherence to protocols and adequacy of environmental cleaning

Supplemental

- Track use of antibiotics associated with CDI in a facility

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California Antimicrobial Stewardship Program Initiative

- Component of the CDPH HAI Program
- Goal is to assist all California hospitals and long-term care facilities optimize antimicrobial use to improve patient outcomes
- www.cdph.ca.gov/programs/hai/pages/AntimicrobialStewardshipProgramInitiative.aspx
- Contact Kavita K. Trivedi at ktrivedi@cdph.ca.gov for more information

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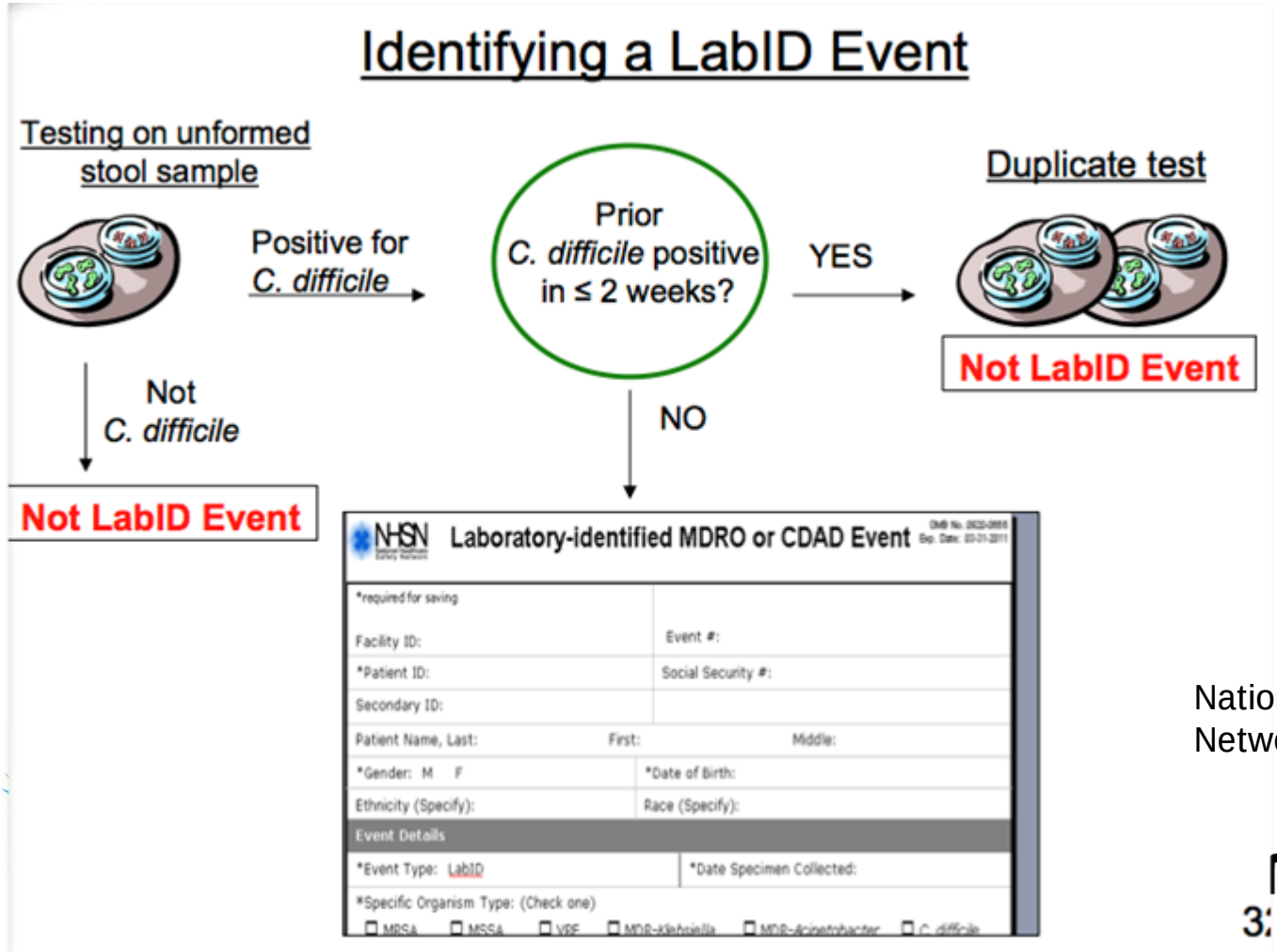
CDI Prevention Outcome Measure - 1

- Use NHSN surveillance methods for CDI



National Healthcare Safety Network, CDC

CDI Prevention Outcome Measure - 2

- In CDI LabID surveillance
  - Positive C diff tests put through an algorithm
  - Cases categorized based on
    - admission date to facility
    - date of specimen collection

Specimen Collected	Case Defined as
> 3 Days after admission	**Healthcare Facility Onset (HO)**
Day 1, 2, or 3 of admission	**Community Onset (CO)**
From patient discharged ≤4 weeks prior	**Community Onset Healthcare Facility Associated (CO-HCFA)**

*National Healthcare Safety Network, CDC

CDI Prevention Outcome Measure - 3

For repeat CDI in the same patient, considered either a new infection or a recurrence of the previous infection

- Incident (new)
  specimen obtained >8 weeks after the most recent LabID Event
- Recurrent
  specimen obtained >2 weeks and ≤ 8 weeks after most recent LabID Event

*National Healthcare Safety Network, CDC

SHEA/IDSA Compendium of Recommendations

S81 INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY OCTOBER 2008, VOL. 29, SUPPLEMENT 1

SUPPLEMENT ARTICLE: SHEA/IDSA PRACTICE RECOMMENDATION

Strategies to Prevent *Clostridium difficile* Infections in Acute Care Hospitals

Erik R. Dubberke, MD; Dale N. Gerding, MD; David Classen, MD, MS; Kathleen M. Arias, MS, CIC; Kelly Podgorny, RN, MS, CPHQ; Deverick J. Anderson, MD, MPH; Helen Burstin, MD; David P. Calfee, MD, MS; Susan E. Coffin, MD, MPH; Victoria Fraser, MD; Frances A. Griffin, RRT, MPA; Peter Gross, MD; Keith S. Kaye, MD; Michael Klompas, MD; Evelyn Lo, MD; Jonas Marschall, MD; Leonard A. Mermel, DO, ScM; Lindsay Nicolle, MD; David A. Pegues, MD; Trish M. Perl, MD; Sanjay Saint, MD; Cassandra D. Salgado, MD, MS; Robert A. Weinstein, MD; Robert Wise, MD; Deborah S. Yokoe, MD, MPH

CDI Checklist Example

***Clostridium difficile* Infection (CDI) Checklist**

Hospital interventions to decrease the incidence and mortality of healthcare-associated *C. difficile* infections

Prevention Checklist

• When an MD, PA, NP, or RN suspects a patient has CDI:

Physician, Physician Assistant, or Nurse Practitioner:
- ☐ Initiate *Contact Precautions Plus*
- ☐ Order stool *C. difficile* toxin testing
- ☐ Discontinue non-essential antimicrobials
- ☐ Discontinue all anti-peristaltic medications

Registered Nurse:
- ☐ Obtain stool sample for *C. difficile* toxin test
- ☐ Place patient in single-patient room
- ☐ Place *Contact Precautions Plus* sign on patient's door
- ☐ Ensure that gloves and gowns are easily accessible from patient's room
- ☐ Place dedicated stethoscope in patient's room
- ☐ Remind staff to wash hands with soap and water following patient contact

Microbiology Laboratory Staff Person:
- ☐ Call relevant patient floor with positive *C. difficile* toxin test result
- ☐ Provide daily list of positive test results for Infection Control

Infection Control Practitioner:
- ☐ Check microbiology results daily for positive *C. difficile* toxin results
- ☐ Call relevant floor to confirm that patient with positive *C. difficile* toxin results is in a single-patient room and that the *Contact Precautions Plus* sign is on the patient's door
- ☐ Flag the patient's *C. difficile* status in the hospital's clinical information system or in the patient's paper chart
- ☐ Alert housekeeping that the patient is on *Contact Precautions Plus*

Environmental Services Staff Person:
- ☐ Prior to discharge cleaning, check for *Contact Precautions Plus* sign on the patient's door
- ☐ If *Contact Precautions Plus* sign is on the door, clean the room with a bleach-based cleaning agent
- ☐ Confirm for supervisor that bleach-based cleaning agent was used for discharge cleaning for every patient on *Contact Precautions Plus*

Treatment Checklist

• When an MD, PA, or NP diagnoses mild CDI: *All of the following criteria are present: diarrhea (<6 BM/day), no fever, WBC<15,000, no peritoneal signs, and no evidence of sepsis*

Physician, Physician Assistant, or Nurse Practitioner:
- ☐ Initiate oral metronidazole at dose 500mg every 8 hours
- ☐ If no clinical improvement by 48-72 hours after diagnosis, treat patient as moderate CDI
- ☐ Continue therapy for at least 14 days total and at least 10 days after symptoms have abated

• When an MD, PA, or NP diagnoses moderate CDI: *At least one of the following criteria is present: diarrhea (6-12 BM/day), fever 37.5-38.5°C, WBC 15,000-25,000, or frankly visible stable lower gastrointestinal bleeding*

Physician, Physician Assistant, or Nurse Practitioner:
- ☐ Initiate oral vancomycin at dose 250mg every 6 hours
- ☐ If no clinical improvement by 48 hours, add IV metronidazole at dose 500mg every 8 hours
- ☐ Consider obtaining infectious disease consultation
- ☐ Consider obtaining abdominal CT scan
- ☐ Continue therapy for at least 14 days total and at least 10 days after symptoms have abated

• When an MD, PA, or NP diagnoses severe CDI: *At least one of the following criteria is present: diarrhea (>12 BM/day), fever >38.5°C, WBC >25,000, hemodynamic instability, marked & continuous abdominal pain, ileus, absence of bowel sounds, evidence of sepsis, or intensive care unit level of care required*

Physician, Physician Assistant, or Nurse Practitioner:
- ☐ Obtain immediate infectious disease consultation
- ☐ Obtain immediate general surgery consultation
- ☐ Obtain abdominal CT scan
- ☐ Initiate oral vancomycin at dose 250mg every 6 hours together with IV metronidazole at dose 500mg every 6 hours
- ☐ Following consultation with general surgery regarding its use, consider rectal vancomycin
- ☐ Ask general surgery service to assess the need for colectomy

Abbreviations: MD=medical doctor, PA=physician assistant, NP=nurse practitioner, RN=registered nurse, BM=bowel movement, WBC=white blood cell count, CT=computed tomography, IV=intravenous

FIGURE 1. *Clostridium difficile* infection checklist at Brigham and Women's Hospital.

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Questions?

For more information, please contact any HAI Liaison Team member.

Thank you